

E-04

Barrier Evolution of Magnetic Tunnel Junction by Annealing and under Biased Condition

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Energy-filtered transmission electron microscopy (EFTEM) and *in situ* electron holography were applied to study changes to the tunnel barrier behavior of CoFe/MgO_x/CoFe magnetic tunnel junctions as a function of annealing and applied electrical bias. During annealing oxygen moved to the MgO_x to form a more stoichiometric and homogenous crystalline tunnel barrier, and Co diffused into the barrier. There is no significant change in Fe distribution.

Annealing also results in a reduction of the barrier height. The effect of varying the bias voltage from -1.5 V–1.5 V is to change barrier asymmetry and to decrease the effective barrier width. These changes are a result of charge accumulation at the interface.

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